

REMARKS

This application has been amended so as to place it in condition for allowance at the time of the next Official Action.

The Official Action objects to the drawings under 37 CFR 1.83(a) as failing to show every feature of the invention specified in the claims. The Official Action draws particular attention to the recited "two array output signals".

The applicants note that the language in the paragraph spanning pages 8 and 9 of the substitute specification describes the construction of Figure 2. Moreover, the sentence beginning on page 8, line 21 states that the output of the summing device 18 produces "an array output signal". The paragraph spanning pages 3 and 4 of the substitute specification states that two different array output signals are produced, each having a respective transmission path.

Figure 4 is described on page 4 of the substitute specification as illustrating an embodiment in which a combination of arrays is used. Figure 4 is described in greater detail beginning on page 11, line 15 of the substitute specification. There it is described that the microphones 29-33 along the front of the spectacles are fed to both the left ear and the right ear. However, the signals from microphones 26-28 are coupled to the transmission path for the left ear, and hence contribute to the array output signal for only the left ear.

Correspondingly, the output signals from microphones 34-36 are fed only to the transmission path for the right ear.

Accordingly, applicants respectfully suggest that Figure 4, taken together with either Figure 2 or 3, fully illustrate the presence of two array output signals in the present claims.

The Official Action rejects claim 1 under the written description requirements of 35 USC §112, first paragraph. Corresponding to the drawing objection considered above, the present rejection is based on the recitation of "two array output signals" in the rejected claim.

In light of the nature of this rejection, reference will be made to the specification as originally filed, as opposed to the substitute specification. In this regard, the Examiner's attention is directed to page 1, line 32; page 1, lines 36-37; page 2, line 8; page 3, line 13; and page 3, lines 19-25. This is not meant to be an exhaustive list of every passage in the specification as originally filed that makes reference to two array output signals. However, applicants respectfully suggest that this partial list makes evident the full support for the recited feature.

The Official Action rejects claims 5, 6, and 9 under 35 USC §112, second paragraph, as being indefinite. Reconsideration

and withdrawal of this rejection are respectfully requested for the following reasons:

Please note that applicants have canceled each of the pending claims, and replaced the same with new claims 12-26. Each of the new claims is believed to recite language that meets the requirements for definiteness under U.S. law. Applicants note that the weighting factor device and summing device pairs are those illustrated in Figure 3 as originally filed (e.g., 18 and 23; 19 and 24; 20 and 25; and 27 and 26).

The Official Action rejects the following sets of claims under 35 USC §102(b) as being anticipated by the identified references: claim 1 by ZUREK 5,764,778; and claims 1-4 by GORIKE 4,904,078. The Official Action also rejects claims 5-11 as unpatentable over ZUREK in view of ADKINS et al. 5,581,495. Reconsideration and withdrawal of these rejections are respectfully requested for the following reasons:

Please note that applicants have canceled each of the rejected claims, and replaced the same with new claims 12-26. The new claims are believed to recite features that are neither disclosed, taught, nor suggested by the known prior art.

In this regard, applicants note that the prior art includes not only those references cited by the current and previous Official Actions, but also other references that have recently come to the attention of the applicants, namely:

US-5,201,006 (Weinrich Soren)
EP 0 229 230 B1 (Zwicker)
DE-OS 2 236 968 (Schmitt)

A copy of the first page of each of these references is included with the present amendment, for the Examiner's convenience. Applicants note that two of the three references are not in the English language. Accordingly, applicants are preparing the concise explanation of relevance required for non-English language references, and will be including the same with a formal Information Disclosure Statement to be filed shortly.

Following is analysis of the present invention as recited in light of all known prior art, including references previously cited during prosecution and the three references identified above:

The prior art in general, and the EP reference identified above in particular, discloses a directional microphone arrangement comprising an array of microphones that is arranged for reception of a signal from a preferred direction. To this extent, the signals of the microphones are combined to obtain a single output signal, which may be provided to at least one ear of a person hard of hearing. The beam formation is arranged in such a way that only a single output signal is obtained.

Figure 4 of the EP reference shows a hearing aid arranged in spectacles as an embodiment utilizing the schematic circuit of Figure 3.

According to Figure 3, microphone signals from a left and a right side of spectacles are combined to form the single output signal Sa'. Further, the single output signal Sa' is provided as a sound signal to both ears in the EP reference.

Other prior art references, such as the DE reference above, disclose a directional microphone arrangement comprising an array of microphones, specifically directional microphones. In use, the signals of the microphones are processed in such a way that a single signal of sound originating in a main sensitivity direction along a main axis (e.g., "+", Figure 4 of the DE reference) is transformed to two output signals (each indicated as "T", Figure 6 of the DE reference).

Figure 6 of the DE reference shows schematically a circuit (left) and a further circuit (right) for such processing to obtain each of the two output signals respectively. The processing in each circuit is such that sound signals coming from the sides ("sl" and "sr", respectively, Figure 6), are cancelled out. The sound signal coming from the front ("v" in Figure 6) is preserved and used for transmission to one of the ears. Therefore, by using the two circuits and their processing, a binaural hearing aid with two transmission paths can be formed.

However, the hearing aid has only a single sensitivity direction ("v").

The individual output signals are provided separately for each ear. However, as explained above, due to the processing to obtain a single sensitivity direction, the two output signals carry substantially identical content, i.e., sound from the sensitivity direction, as indicated in figure 6 by the references "T".

In the present invention, two output signals are provided, one for the left ear and the other for the right ear, wherein the two output signals each are associated with (first sound originating from) a first main sensitivity direction and (second sound from) a second main sensitivity direction, respectively. The perception of directionality is obtained from the use of the two output signals, which signals differ from each other due to beam forming of beams directed in the first and second main sensitivity directions, respectively.

Some of the known prior art, including the DE reference above, disclose the use of two output signals transmitted to both ears of a user. However, due to the way the input signals of the side and front microphones are added and subtracted, the two output signals carry the same content originating from a single main sensitivity direction. Additionally, the audio signals,

from which the sensitivity direction is derived, are registered by directional microphones.

In the present invention as now claimed, the microphones in the array are omni-directional microphones.

In some of the prior art that teaches use of essentially the same signal to both of the user's ears, the two output signals carry the same content originating from a single main sensitivity direction. The audio signals, from which the sensitivity direction is derived, are registered by directional microphones.

A disadvantage of this approach is that due to the single sensitivity direction, a user must be conscious of how the device is aimed to obtain audio information. To obtain adequate audio signals, the user must aim strongly towards an audio source. As a result, spatial information to the user is lacking.

The present invention as claimed overcomes the disadvantages of the prior art, since it includes deriving two main sensitivity directions from the microphone signals of the array of microphones by beam forming, to associate an output signal with each sensitivity direction and to transmit each of the output signals to the respective ear. In this way, the user of a hearing aid in accordance with the present invention is capable of perceiving directionality and obtaining spatial

information. Moreover, this is achieved with omni-directional microphones.


Entry of the above amendments is earnestly solicited. Applicants respectfully request that a timely Notice of Allowance be issued in this case.

Should there be any matters that need to be resolved in the present application, the Examiner is respectfully requested to contact the undersigned at the telephone number listed below.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. §1.16 or under 37 C.F.R. §1.17.

Respectfully submitted,

YOUNG & THOMPSON


Eric Jensen, Reg. No. 37,855
745 South 23rd Street
Arlington, VA 22202
Telephone (703) 521-2297
Telefax (703) 685-0573
(703) 979-4709

EJ/lrs

APPENDIX:

The Appendix includes the following item(s):

- a copy of the first page of three prior art references



US005201006A

United States Patent [19]
Weinrich

[11] **Patent Number:** 5,201,006
 [45] **Date of Patent:** Apr. 6, 1993

[54] **HEARING AID WITH FEEDBACK COMPENSATION**

[75] **Inventor:** Soren Weinrich, Espergaerde, Denmark

[73] **Assignee:** Oticon A/S, Denmark

[21] **Appl. No.:** 563,201

[22] **Filed:** Aug. 6, 1990

[30] **Foreign Application Priority Data**

Aug. 22, 1989 [DK] Denmark 4128/89

[51] **Int. Cl.:** H04R 25/00

[52] **U.S. Cl.:** 381/68; 381/68.2; 381/93

[58] **Field of Search** 381/68, 68.6, 69, 150, 381/153, 154, 120, 121, 68.2, 68.4, 93

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,944,944	3/1976	Ellenbecker	381/120
4,455,675	6/1984	Bose et al.	381/71
4,456,795	6/1984	Saito	381/68.2
4,485,272	11/1984	Duong et al.	381/93
4,649,565	3/1987	Kaizer et al.	381/120
5,003,606	3/1991	Bordewijk	381/68

5,033,090 7/1991 Weinrich 381/68.4

Primary Examiner—Jin F. Ng

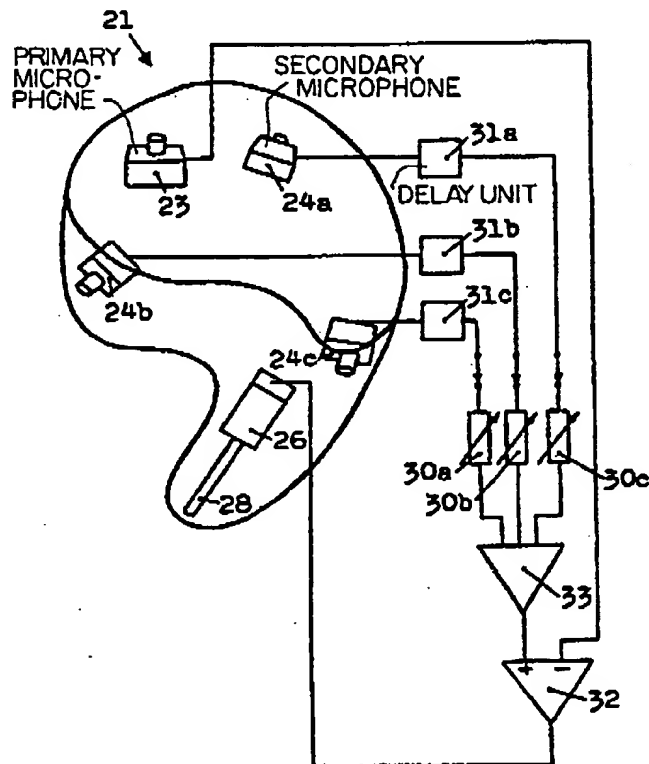
Assistant Examiner—Huyen D. Le

Attorney, Agent, or Firm—Larson and Taylor

[57] **ABSTRACT**

In a hearing aid with feedback compensation by virtue of at least one secondary microphone feeding into a delay unit and an attenuator feeding into one input of a difference amplifier, the other input with opposite polarity of which is connected to the output of the primary microphone receiving the ambient sound to be amplified and fed into the hearing-aid receiver and output duct, at least two secondary signal paths are provided. Each path comprises a secondary microphone with its associated delay unit and attenuator. An operational control unit may select the strongest signal to be used for feedback compensation. This makes it possible to achieve feedback compensation in various situations, such as may arise e.g. with an "in-the-ear" hearing aid when the user is chewing or yawning, creating various possible paths from the output duct past the housing of hearing aid to the primary microphone.

13 Claims, 4 Drawing Sheets




Europäisches Patentamt
European Patent Office
Office européen des brevets

Veröffentlichungsnummer: **0 229 230**
B1

EUROPÄISCHE PATENTSCHRIFT

Veröffentlichungstag der Patentschrift:
13.06.90

Int. Cl.: H04R 1/40, H04R 25/00

Anmeldenummer: 86113802.2

Anmeldetag: 06.10.85

Richtmikrofonanordnung.

Priorität: 16.10.85 DE 3538885

Patentinhaber: Siemens Aktiengesellschaft,
Wittelsbacherplatz 2, D-8000 München 2(DE)

Veröffentlichungstag der Anmeldung:
22.07.87 Patentblatt 87/30

Erfinder: Zwickor, Eberhard, Prof. Dr.,
Walchatedterstrasse 38, D-8021 Icking(DE)
Erfinder: Beckenbauer, Thomas, Dipl.-Ing.,
Loristrasse 2, D-8000 München(DE)
Erfinder: Baer, Günther, Dipl.-Ing., Sieglitzhofer
Strasse 48, D-8520 Erlangen(DE)

Bekanntmachung des Hinweises auf die Patenterteilung:
13.06.90 Patentblatt 90/24

Benannte Vertragsstaaten:
AT CH DE FR GB IT LI NL SE

Entgegenhaltungen:
DE-A-2 362 874
DE-A-3 102 208
DE-A-3 102 530
FR-A-2 282 788
FR-A-2 436 416
US-A-2 301 744

EP 0 229 230 B1

Anmerkung: Innerhalb von neun Monaten nach der Bekanntmachung des Hinweises auf die Erteilung des europäischen Patents im Europäischen Patentblatt kann jedermann beim Europäischen Patentamt gegen das erteilte europäische Patent Einspruch einlegen. Der Einspruch ist schriftlich einzureichen und zu begründen. Er gilt erst als eingelegt, wenn die Einspruchsgebühr entrichtet worden ist (Art. 99(1) Europäisches Patentübereinkommen).

ACTORUM AG

51

BUNDESREPUBLIK DEUTSCHLAND

Int. Cl.:

H 04 r, 25/00

H 04 r, 1/40

DEUTSCHES PATENTAMT



52

Deutsche Kl.:

21 a2, 17/03

21 a2, 16/01

10

11

21

22

23

Offenlegungsschrift 2 236 968

Aktenzeichen: P 22 36 968.2

Anmeldetag: 27. Juli 1972

Offenlegungstag: 7. Februar 1974

Ausstellungspriorität: —

24

Unionspriorität

25

Datum: —

26

Land: —

27

Aktenzeichen: —

54

Bezeichnung:

Richtmikrofonanordnung für Hörgerät

61

Zusatz zu:

2 222 543

62

Ausscheidung aus:

—

71

Anmelder:

Schmitt, Werner, 8398 Pocking

Vertreter gem. § 16 PatG: —

72

Als Erfinder benannt:

Antrag auf Nichtnennung

DT 2236968